MAKING THE INVISIBLE VISIBLE

Groundwater, Public Health and People's Perception

Tannie Eshenaur, M.P.H.
Drinking Water Protection

Minnesota Groundwater Association
April 24, 2013


MINNESOTA STATE
FAIR


The Eco Experience

Personal Health vs. Population Health

Medical

- Physician - patient
- Clinics
- X-rays, lab tests, histories

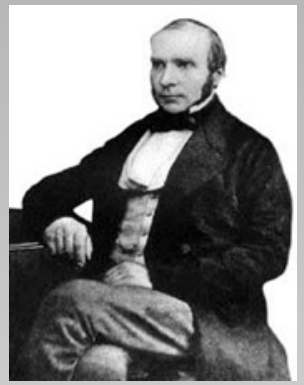
Public Health

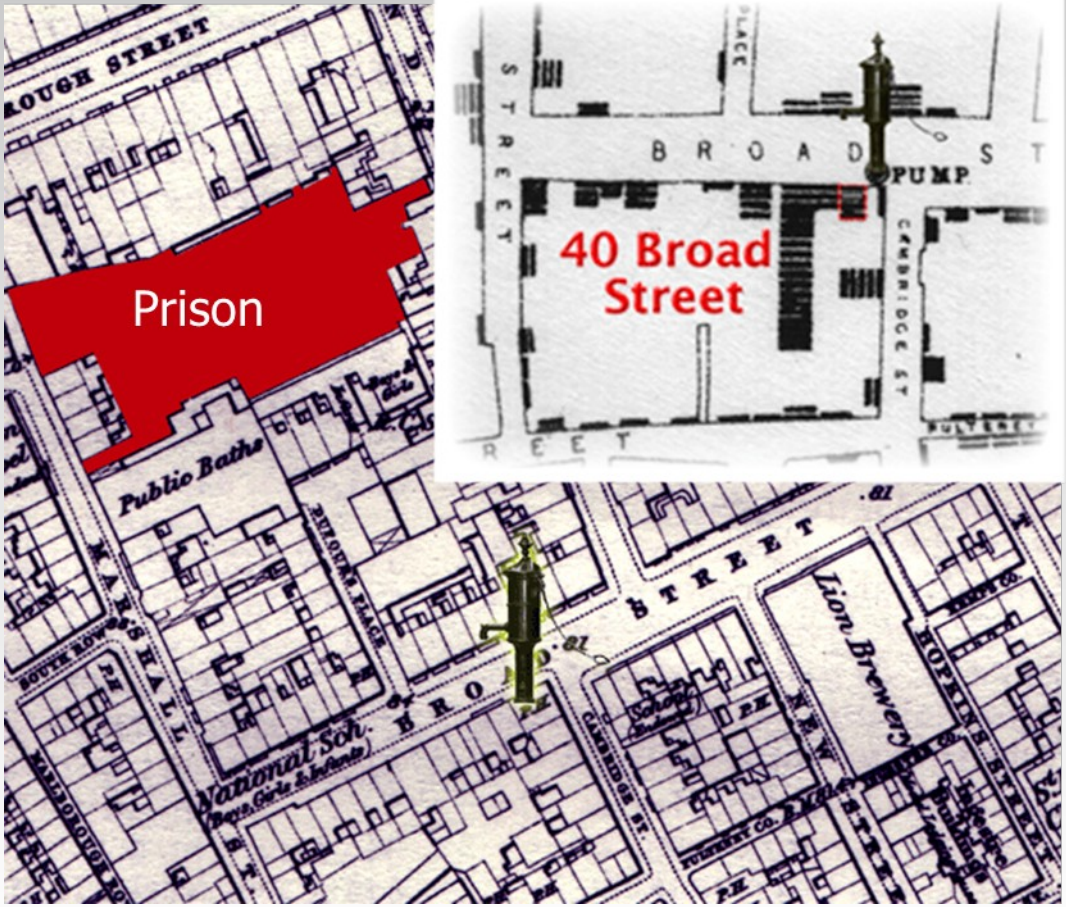
- Multi-disciplinary
  Engineers,
  Epidemiologists,
  Hydrogeologists,
  Planners,
  Health Educators
- Risk assessment
- Risk management
- Policy
- Systems

London, 1850's ~ Cholera

"A Court for King Cholera," Punch, 1852
http://www.st-and.ac.uk/~city19c/viccity/houshealth.html, accessed 10/4/2002

John Snow and Cholera – 1850's



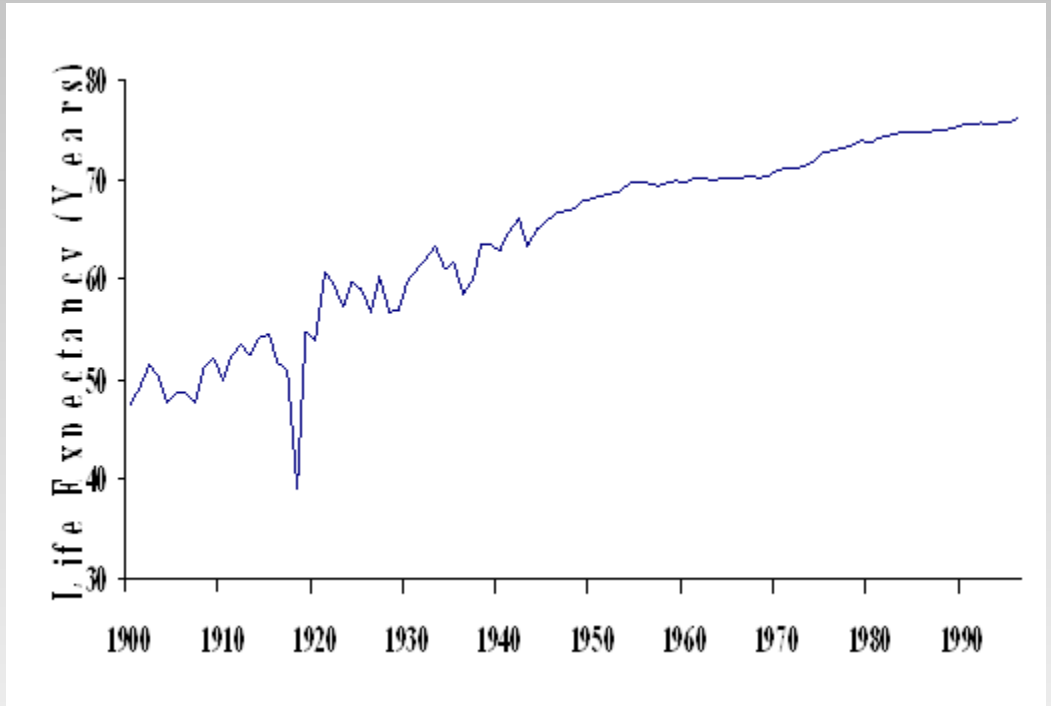


No pump handle!

http://www.ph.ucla.edu/epi/snow/snowpub.html

Public Health = Longer Lives

- Lifespan almost doubles
- Leading causes of death: no longer due to environmental factors



25 of the 30 years of life gained in the 20th century resulted from public health accomplishments -- CDC

CLEAN WATER LAND & LEGACY AMENDMENT

Environmental Public Health

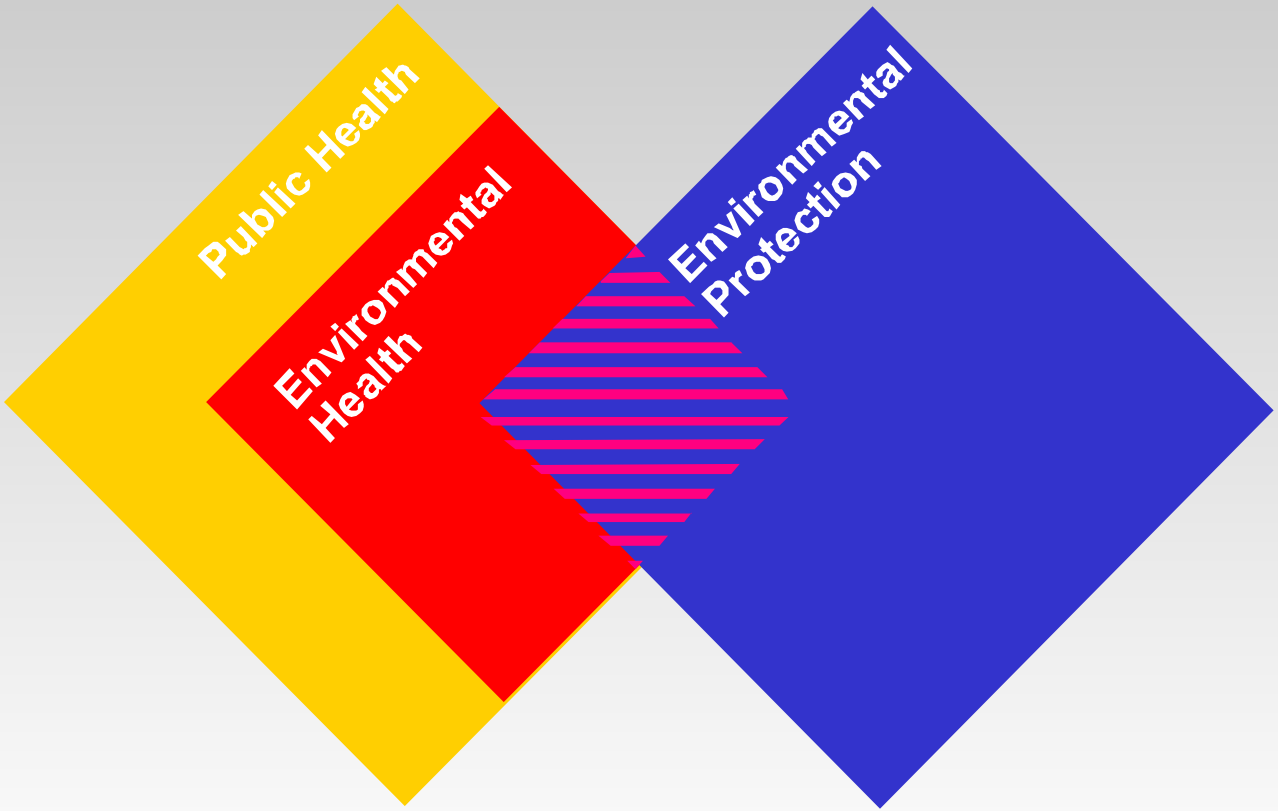


Diagram courtesy of Australia's EnHealth.

Ensure physical environmental conditions in which communities can be healthy

Drinking Water Protection

- Ensure safe and sufficient drinking water
- through a series of strategic safeguards
- from source to tap

MN Drinking Water Sources

- Surface water systems (~21 community systems)
  - Serve 25% of population
  - Intake protection a voluntary process
  - 3 systems have approved plans
- Groundwater systems (~925 community systems)
  - Serve 55% of population
- Remaining 20% of population is served by private wells

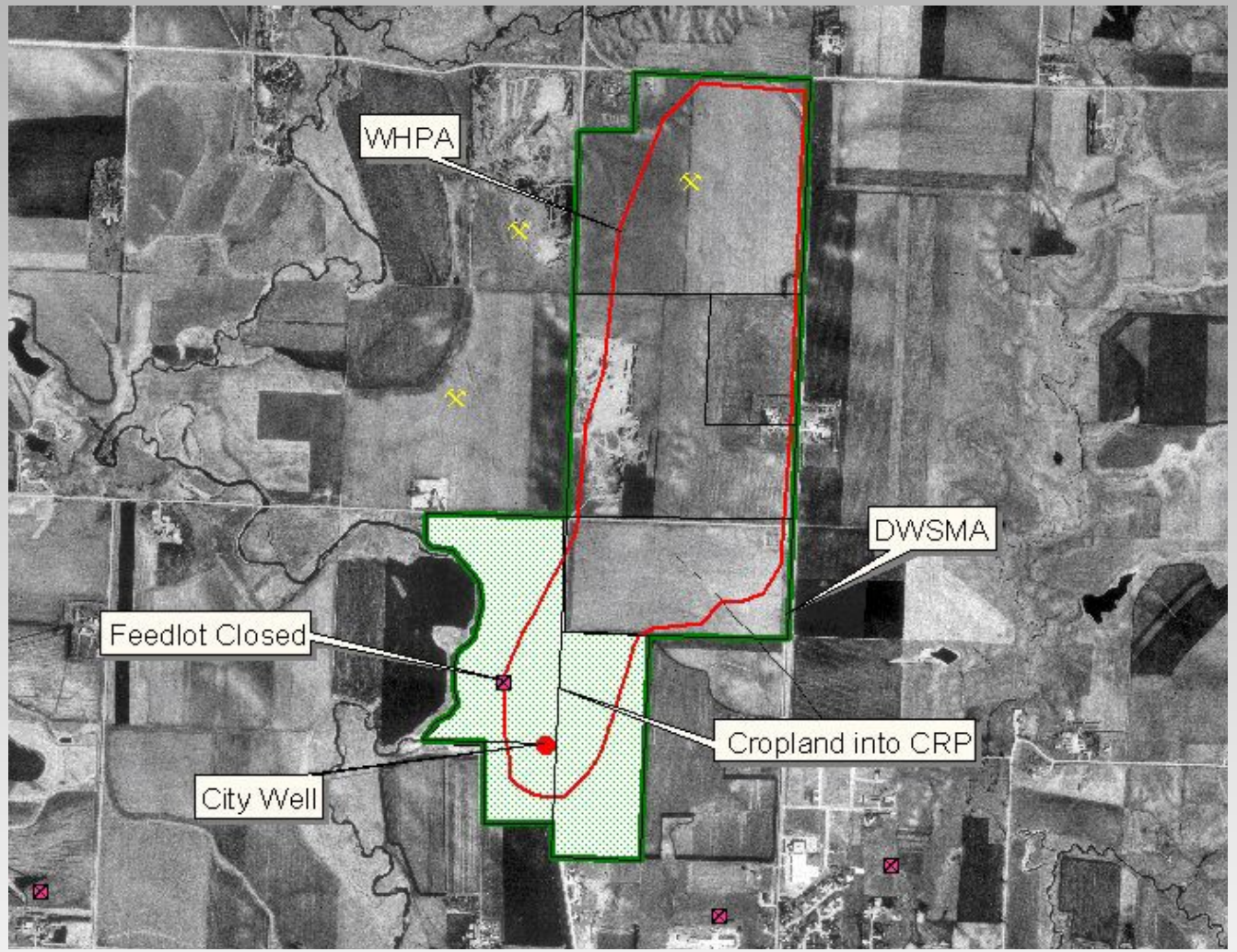
Source Water Protection (SWP)

Prevent anthropogenic contamination from entering sources of public drinking water

- Mandated in MN statute and rule,
  - Safe Drinking Water Act
- MDH provides technical assistance
  - Plan development
  - Plan implementation
- Wellhead Protection team at the community level

SWP source water protection

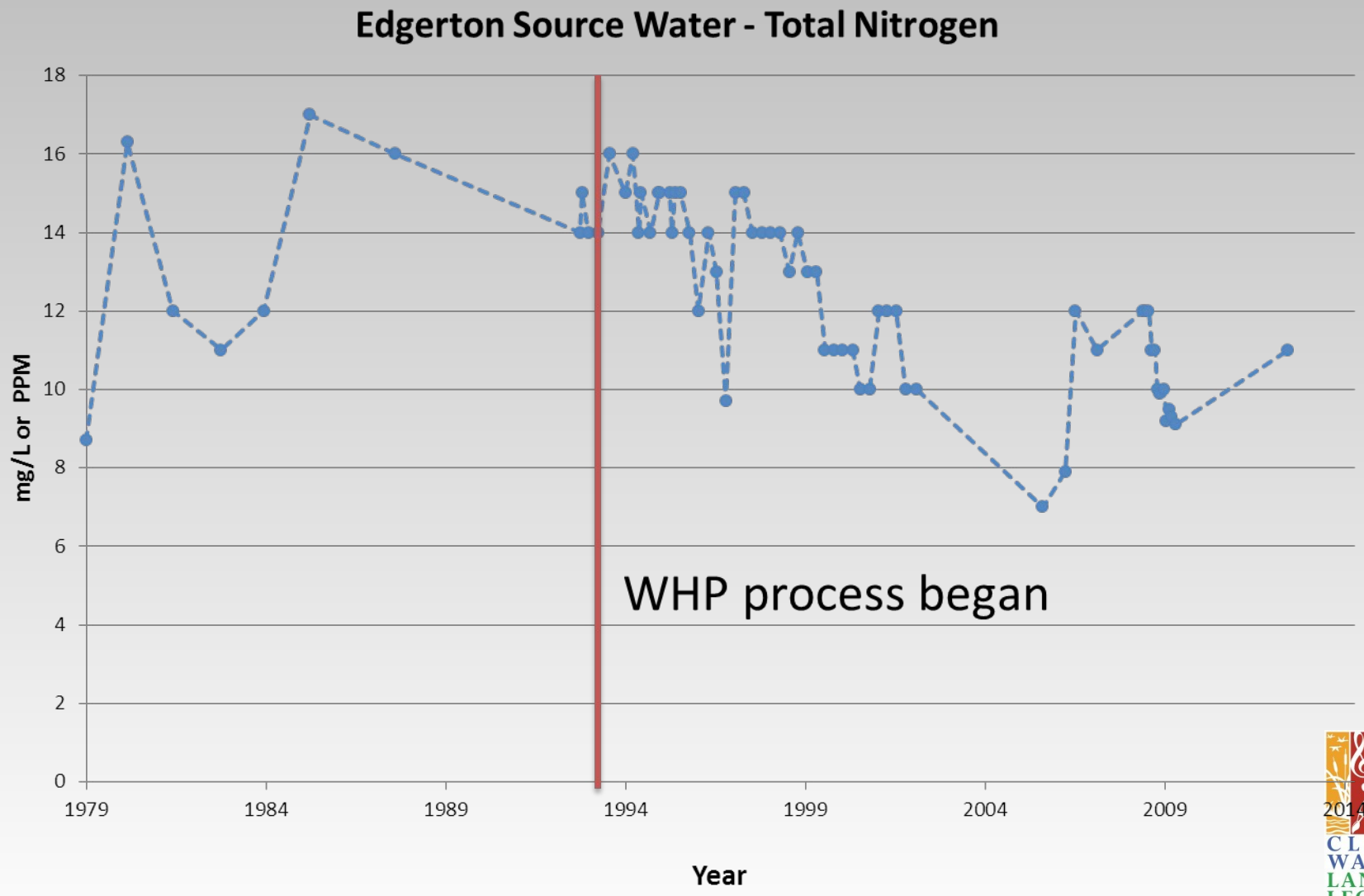
CLEAN WATER LAND & LEGACY AMENDMENT



Brian Williams/MDA

Modified land use in Edgerton

SWP Outcomes - Edgerton



Geologic Protection and Casing Grout

Figure 3: Nitrate and Geologic Protection, February 2008

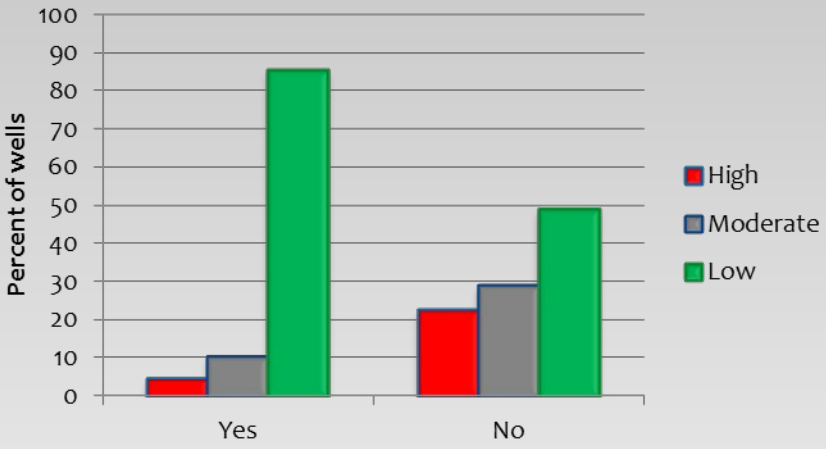
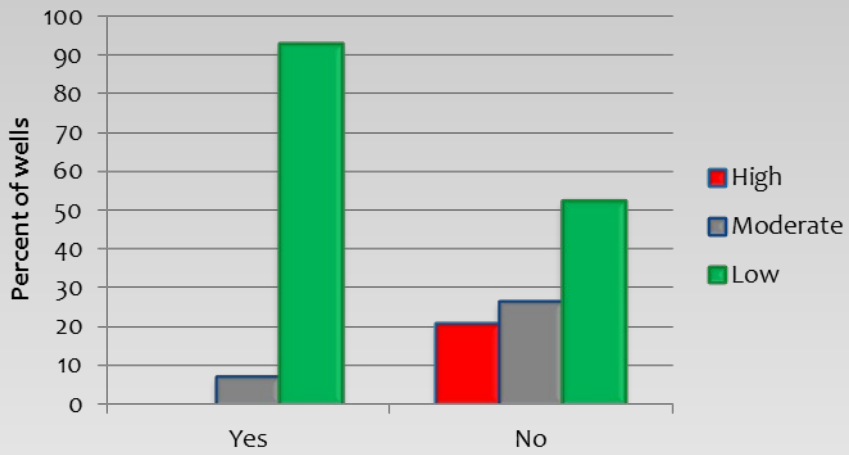
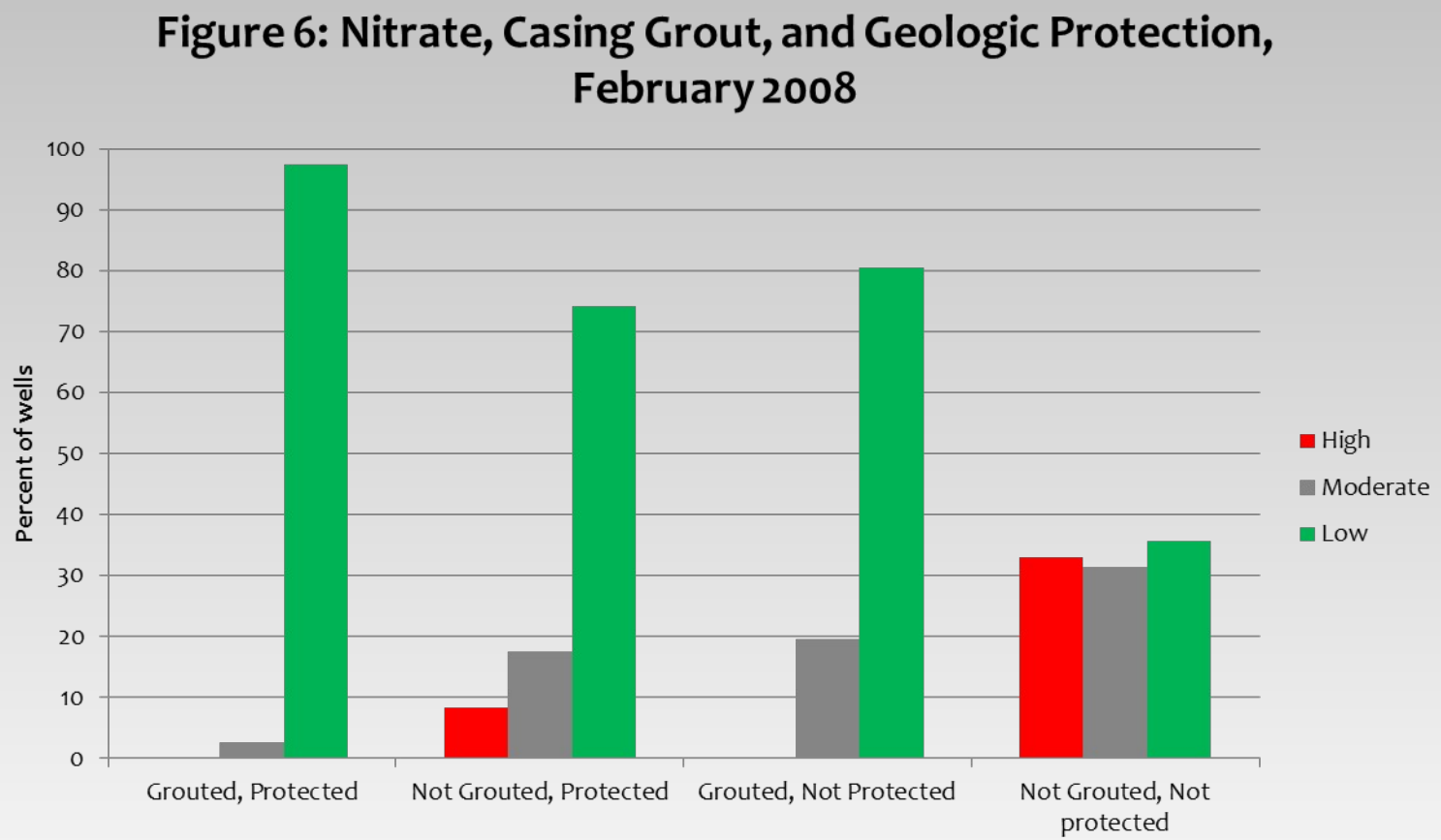


Figure 4: Nitrate and Casing Grout, February 2008



MDH – Jim Lundy April 2013

Geologic Protection and Casing Grout



MDH – Jim Lundy April 2013

Median Nitrate for Two Categories of Wells

Well	Matrix	Geologic Protection	Casing Grout	Surface Drainage	N	% Low	% Moderate	% High	Median $[NO_3]$, mg/L
Most-Desirable	C or Q	Yes	Yes	Away	43	97.7	2.3	0	**0.1**
Least-Desirable	S or B	No	No	Toward	24	12.5	37.5	50.0	**10.4**

Round 1 Nitrate Results for Most-Desirable and Least-Desirable Wells

Wells built according to the water well construction code exclude surface contaminants

MDH – Jim Lundy April 2013

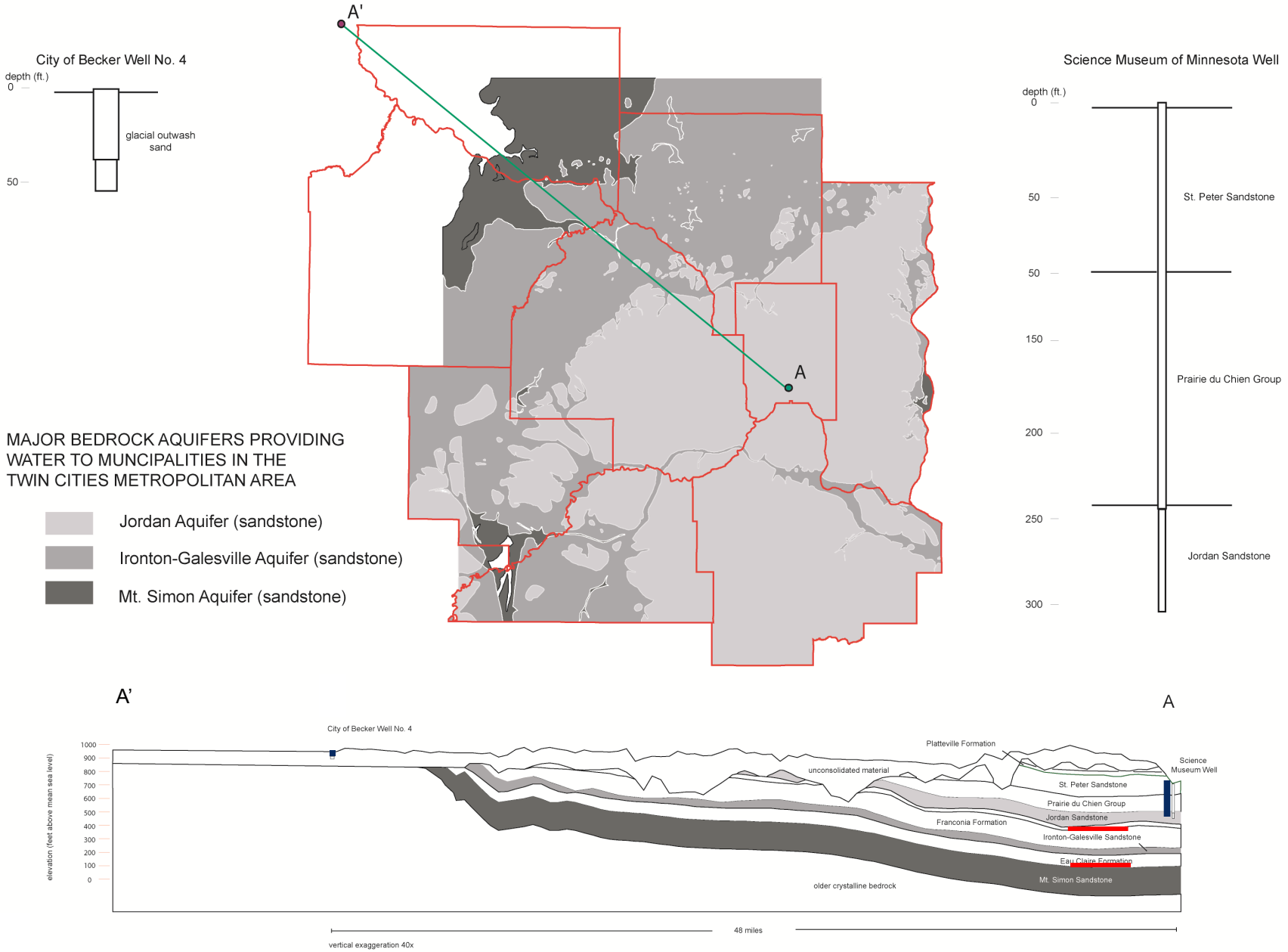

TO THE "MDH" WHO SAYS OUR WATER IS SAFE TO DRINK!
YEAH, TO THE "MDH..." YOU GO FIRST.
CLINK
MINNESOTA DEPT. OF HEALTH:
"VERY LITTLE PFBA IN WOODBURY'S DRINKING WATER."
WOODBURY BULLETIN

Risk Communication Basics

- People are not just empty vessels to be filled with facts.
- Need to start where they are
- Acknowledge their understandings, worldview, concerns

  (earn your right to be heard)
- Then gradually move towards your message

Bob Tipiping/MGS
http://www.vitamedica.com/twin-cities-tops-list-of-most-healthy-cities/


City of Becker Well No. 4
depth (ft.)
0
glacial outwash sand
50
A'
A
Science Museum of Minnesota Well
depth (ft.)
0
St. Peter Sandstone
50
50
Prairie du Chien Group
150
200
Jordan Sandstone
250
300
MAJOR BEDROCK AQUIFERS PROVIDING WATER TO MUNCIPALITIES IN THE TWIN CITIES METROPOLITAN AREA
Jordan Aquifer (sandstone)
Ironton-Galesville Aquifer (sandstone)
Mt. Simon Aquifer (sandstone)
A'
A
City of Becker Well No. 4
elevation (feet above mean sea level)
1000
900
800
700
600
500
400
300
200
100
0
Platteville Formation
unconsolidated material
Science Museum Well
St. Peter Sandstone
Prairie du Chien Group
Jordan Sandstone
Franconia Formation
Ironton-Galesville Sandstone
Eau Claire Formation
Mt. Simon Sandstone
older crystalline bedrock
48 miles
vertical exaggeration 40x

Risk Communication 101

RISK = HAZARD + OUTRAGE

Peter Sandman

Goal: to provide resources needed to make informed decisions about risks to health and actions to protect health

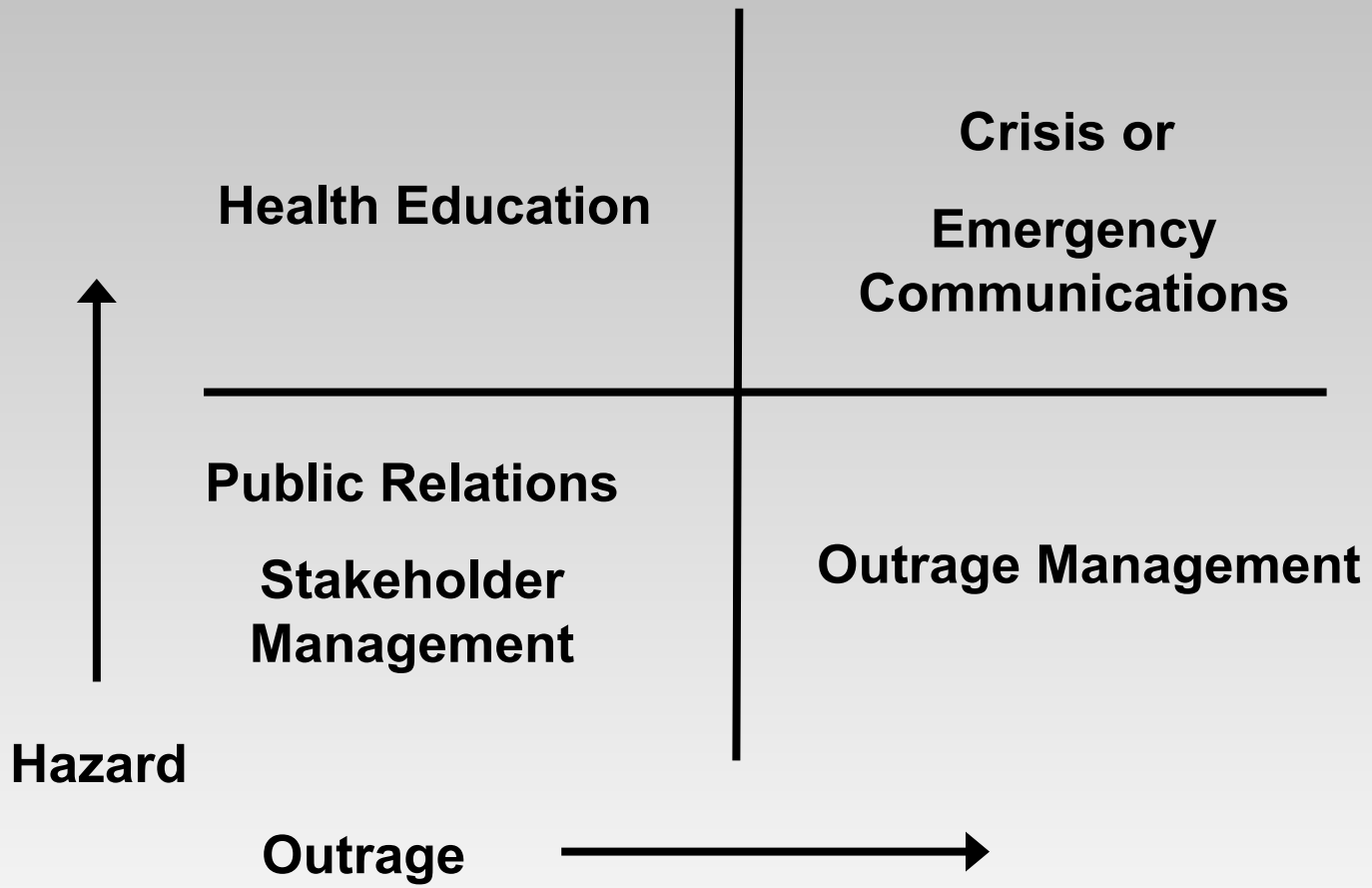
Risk Communication

- "An iterative process of exchange of information and opinions among individuals, groups and institutions."
  National Research Council

- To help …affected communities understand the processes of risk assessment and management, to form scientifically valid perceptions of the likely hazards, and to participate in making decisions about how risk should be managed.
  US EPA

- A science-based approach for communicating effectively in: high concern and low trust situations and sensitive or controversial situations.
  Covello

Sandman's Paradigm



Provoking Outrage

The Minnesota Department of Health's colon ad campaign is raising awareness about colorectal cancer — and raising more than a few eyebrows in the Twin Cities metro. http://www.nydailynews.com accessed April 20, 2013

Risk Perception - Factors

More Acceptable	Less Acceptable
Voluntary	Involuntary
Not dreaded	Dreaded
Controlled by individual	Controlled by others
Clear benefits	Little or no benefit
Fairly distributed	Unfairly distributed
Natural	Manmade
Familiar	Exotic
Affects adults	Affects children

(Fischhoff, et al. 1981)

CLEAN WATER LAND & LEGACY AMENDMENT

Four factors that create believability and trustworthiness:

- **Empathy and caring**
- **Competence and expertise**
- **Honesty and openness**
- **Dedication and commitment**

(Covello, 1992, 1993)

Needs Assessment Project

- Focused on drinking water and contaminants
- Goal of project was to learn from the public, through a series of focus groups:
  - General perception of water quality
  - Perceptions about contaminants
  - Credible sources of information

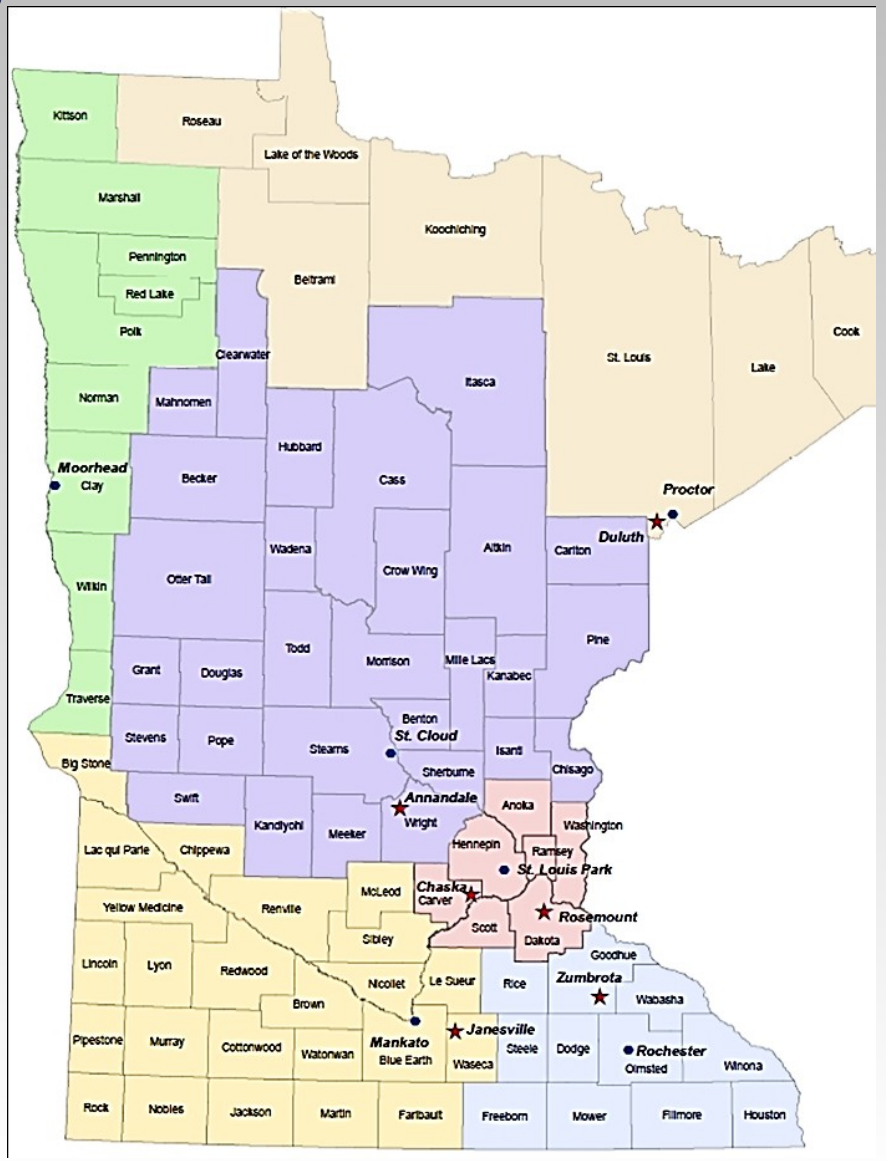
Is My Water Safe to Drink?

I just cringe at the thought of going to a state (Web) site. They're not logical, it's almost like an engineer put it together, it's not very user friendly.

Quote from a focus group participant

Focus Group Design

- 12 focus groups
- ½ rural, private wells
- ½ public water
- 2 in each region
- Comments recorded
- Transcribed
- Analyzed using Qualitative Data Analysis



Findings (1)

Perceptions:

- Drinking water quality is associated with taste, temperature, odor, and clarity
- Water quality problems happen to other people
- Private well water is safer than treated public water
- Well depth and original well test is sufficient indicator of water quality

Findings (2)

Credible Sources:

- City/county entities
- Other local/regional governmental units
- Well drillers
- Community networks/leaders
- State/federal government
- Internet
- Media

Mental Models

- “whatever the goal of a communication, its designers need to address the mental models that recipients bring to it, that is, the pattern of knowledge gaps, overly general understandings, and outright misconceptions that can frustrate learning…One cannot rely on the intuition of technical experts regarding either what laypeople currently believe or what they need to know.”

Atman, Bostrom, Fischoff, and Morgan, 1990

Mental Model (2)

Correct concepts

- Local well driller, water utility, public health can be trustworthy sources of information
- Information from the news media and Internet should be verified with a trustworthy source
- Water quality in Minnesota's public water supplies is good
- Flooding and septic tanks pose a risk to drinking water wells
- Agricultural practices and unsealed unused wells can affect drinking water quality

Mental Model (3)

Misconceptions

- Drinking water quality can be determined by taste, temperature, odor, or clarity.
- Water quality problems happen to other people.
- Private well water and bottled water are safer than public water supplies.
- Well depth and the original well test is a good indicator of water quality in a private well.
- There is an invisible, unlimited supply of groundwater.
- Any amount of a chemical in drinking water is dangerous.
- Well water is free.
- Fluoride causes cavities, bone cancer, obesity, etc.

Mental Model (4)

New concepts

- Not “safe” or “unsafe” dichotomy, the question is “How safe?”
- Balancing risks and benefits; chlorine, fluoride
- Regular testing of well water and proper maintenance are essential to safe drinking water
- Degree of protection afforded by public drinking water supplies
- Sources of drinking water require protection

Contaminants of Emerging Concern

- no clear definition…

  some “new” awareness

  - new chemical
  - new toxicological info
  - new level of detection
  - new media
  - new pathway
- large uncertainties
- health standard lacking or changing

Implications for Risk Communication

- anticipate change

  new scientific developments may be perceived as past errors by public
- acknowledge uncertainty
- discuss the scientific method

  "active area of research"
- explain differences in health guidelines
- serial/spiral health education

Our Messages

- We are taking a cautious public health approach
- This is a area of active scientific research
- As new knowledge becomes available, we will let you know.
- (don't use the word "conservative"),
  - Use "cautious" or "protective"

At an informational meeting in St. Paul Park in January, Mark Lund, of Newport, gazed at the diagrams of PFBA molecules and maps of aquifers.

Even though he wasn't happy about the traces of the PFBA in his water, he wasn't quick to blame it for any health problems.

"There are so many other things, from food additives to air pollution," Lund said. He said other risk factors — including smoking, drinking alcohol, not exercising — should worry people more than PFBA.

A neighbor of his, Tim Grover, of St. Paul Park, agreed.

"The only time I put tap water in my mouth is to brush my teeth," he said. "Ninety-nine percent of the fluid in my body is Mountain Dew."

Effective Risk Communication

- Begins with listening, involves listeners
- Identifies hazard, and also places in exposure pathway context.
- Supports informed decision-making
- Leads to meaningful behaviors that reduce or prevent exposures
- Enhances participation in the public process
- Reinforces other health promotion messages
- Forms messages that translate well into informal education for family, friends and neighbors

The Challenge…

- Essential
- Invisible

- Shared resource
- Shared responsibility
- Shared perspective

“When you drink the water, remember the spring.”

Chinese Proverb

Thank you

Contact information:

Tannie Eshenaur, MPH
Minnesota Department of Health
tannie.eshenaur@state.mn.us
651.201.4074